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ENDLESS BELT FOR PAPERMAKING
[Shoushiyou endoresu beruto]

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Specification /1*

1. Title of the Invention

Endless Belt for Papermaking

2. Claims

1. An endless belt for papermaking equipped with a core body and a flexible coating body covering the periphery of the core body

characterized by the core body being composed of a netted material made by connecting many wires in a manner such that they are intertwined in at least the longitudinal direction of the belt and by at least part of the netted material not being adhered to the coating body.

2. An endless belt according to Claim 1 for papermaking

characterized by the above-mentioned netted material being provided with a netted structure in which multiple spiral wires are arranged in parallel to the longitudinal direction of the belt and in which adjacent spiral wires are connected in a swingable manner by means of connecting wires.

3. An endless belt according to Claim 2 for papermaking

characterized by at least the connecting wires from between the spiral wires and connecting wires not being adhered to the coating body.

4. An endless belt according to Claim 1 for papermaking

characterized by both of the spiral wires and connecting wires being made from metal.

5. An endless belt according to Claim 1 for papermaking

characterized by the netted material being provided with a netted

* Numbers in the margin indicate pagination in the foreign text.

structure in which multiple ring-shaped wires are arranged in parallel along the longitudinal direction of the belt and in which the adjacent ring-shaped wires are connected in a swingable manner by means of connecting wires.

6. An endless belt according to any one of Claim 1 through 5 for papermaking

characterized by a film being fixed onto one side of the coating body.

7. An endless belt according to any one of Claim 1 through 5 for papermaking

characterized by one side of the coating body being provided with drains.

3. Detailed Description of the Invention

[Field of Industrial Application]

This invention relates to an endless belt for papermaking, more specifically to an endless belt suitably utilized as a dehydrating press, such as an extended nip press, in the pressing part of a papermaking /2 process.

[Related Art of the Invention]

As this type of endless belts, those illustrated in Figure 7 and Figure 8 are conventionally known.

The endless belt illustrated in Figure 7 is obtained by burying an endless base cloth 52 inside a polymeric material layer 51, such as a polyurethane resin, and a woven fabric consisting of organic fiber, such as polyester, is utilized as the base cloth 52 (See Kokai No.61-258715).

The endless belt illustrated in Figure 8 is obtained by: forming a net body 53 by arranging in parallel many spiral wires 53a made of a synthetic resin and connecting the spiral wires 53a by using linear connecting wires 53b made of a synthetic resin; and mounting a synthetic resin layer 54 onto the rear side of the net body 53. The net body 53 side acts as the surface that contacts traveling felt (See Jikko No.61-38956).

[Problems that the Invention is to Solve]

The endless belt illustrated in Figure 7 uses a woven fabric consisting of organic fiber as the base cloth 52. Therefore, it has a shortcoming in that it easily stretches during use because of its low strength. This makes the belt poor in terms of durability.

When forming a woven fabric in an endless form, it is possible to use either one of the following two methods: (1) a method by which a flat-shaped woven fabric is formed and then its ends are woven together to make it endless; and (2) a method by which a woven fabric is made as a sac so that it is endless from the beginning. However, according to the method (1), the weaving operation for connecting the fabrics is difficult to perform, and the thickness of the connecting part is large since the fabrics are connected by the warps being mutually intertwined, leading to the problem of decreased uniformity of the belt's thickness.

Meanwhile, according to the method (2), the wefts are in the longitudinal direction (traveling direction) of the belt. Therefore, it is difficult for the shape of the base cloth 52 to be constant as well as the deformation of the belt becomes likely. These make it very difficult

to adjust the dimensions. Moreover, in a case in which a resin, such as a polyurethane resin, is processed while heating the base cloth 52, the distortion of the belt becomes large, and the belt may become deformed after the production.

Moreover, according to the endless belt illustrated in Figure 8, the net body 53 is exposed. Therefore, when a tensile force acts on it, the spiral wires 53a made of a synthetic resin that make up the net body 53 become stretched, and the connecting members 53b made of a synthetic resin become deformed. For this reason, the belt becomes greatly elongated and thus cannot withstand practical use.

In light of this, the purpose of this invention is to supply an endless belt for papermaking which has suitable flexibility, elongates very little, is easy to be made uniform in terms of thickness, is easy to be made endless, is easy to adjust in terms of dimensions, and also has excellent durability.

[Means for Solving the Problems]

In order to achieve the above purpose, with respect to an endless belt for papermaking equipped with a core body and a flexible coating body covering the periphery of the core body,

this invention is characterized by the core body being composed of a netted material made by connecting many wires in a manner such that they are intertwined in at least the longitudinal direction of the belt and by at least part of the netted material not being adhered to the coating body.

The above-mentioned netted material can be provided with a netted structure by arranging multiple spiral wires in parallel to the

longitudinal direction of the belt and by connecting adjacent spiral wires in a swingable manner by means of connecting wires. In this case, it is preferred that at least the connecting wires from between the spiral wires and connecting wires not be adhered to the coating body.

Although it is desirable that both of the spiral wires and connecting wires are made from metal, it is permissible to form the spiral wires from a synthetic resin and to form the connecting wires from a metal.

Moreover, the netted material can be provided with a netted structure by arranging multiple ring-shaped wires in parallel along the longitudinal direction of the belt and by connecting the adjacent ring-shaped wires in a swingable manner by means of connecting wires.

Moreover, one side of the endless belt, that is to say the coating body, can have a film fixed on it or have drains provided in it.

[Operation of the Invention] /3

Since the above-mentioned core body is formed from a netted material constructed by connecting many wires in a manner such that it bends in at least the longitudinal direction of the belt and since at least part of the netted material is not adhered to the coating body, the netted material can change its shape easily inside the coating body in accordance with the belt being bent in the longitudinal direction. This deformability of the netted material results in appropriate flexibility of the belt.

Moreover, since the core body is composed of the netted material, it can be more easily shaped in an endless manner than a core body composed of a woven fabric, and therefore, the thickness of the connecting part does not increase. For this reason, the thickness of the belt is uniform

over the entire length. Moreover, since the netted material can have its length adjusted easily, the dimensions of the belt can also be adjusted with ease.

Also, since the netted material is formed in an endless manner to be used, the elongation of the belt that occurs as a result of a large tensile force is smaller than that of the belt in which a woven fabric is used as the core body, and the durability is also improved.

[Embodiments of the Invention]

In the following, embodiments of this invention will be described based on the accompanying drawings. However, this invention is not limited to these embodiments.

Figure 1 and Figure 2 illustrate a first embodiment of this invention, and the endless belt 1 for papermaking is made by covering the periphery of the core body 2 with a coating body 3. As shown in detail in Figure 2, the core body 2 is made by combining spiral wires 2a made of metal with linear connecting wires 2b made of metal in the form of a net.

In other words, the spiral wires 2a made of metal are perpendicular to the longitudinal direction of the endless belt 1, and many of them are arranged in parallel in the longitudinal direction so that parts of neighboring spiral wires 2a overlap with each other (i.e. are engaged with each other). Moreover, linear connecting wires 2b made of metal are inserted through the overlapping parts of the spiral wires 2a. In this manner, neighboring wires 2a are swingably connected to each other around the linear connecting wires 2b, thus forming the core body 2 as a flat net.

The coating body 3 covers the netted core body 2 from both sides, and the entire core body 2 is buried inside the coating body 3. The two parts are not adhered to each other in at least one area. This is to provide the endless belt 1 with even more appropriate flexibility. In addition, the coating body 3 may instead cover the core body 2 from only one side.

To produce the above endless belt 1, the core body 2 is composed of a netted material made of metal in the form of an endless band. Then, one side of the endless core body 2 is immersed in a fluid coating material consisting of a synthetic resin or the like, which is then cured as it coats the core body. The core body is then reversed and is further immersed in the coating material consisting of a synthetic resin or the like, which is then cured as it coats the core body. Lastly, the surface of the coating body 3 is polished to complete the endless belt.

It is essentially difficult for the core body 2 made of metal and the coating body 3 to adhere to each other. Therefore, it is not necessary to perform a special treatment when coating the coating material around the core body 2, but in order to ensure that the core body 2 and coating body 3 do not adhere to each other, it is desirable to start the coating process after coating the core body 2 with a commonly-known material utilized as a mold release agent for the formation of a synthetic resin, such as a fluororesin, silicon, etc.

To form the spiral wires 2a and connecting wires 2b from a synthetic resin, it is possible to use monofilaments or multifilaments of a polyamide resin, polyester resin, etc. To form them from metal, it is possible to use wires consisting of iron (preferably plated with zinc or the like),

stainless steel, copper, etc.

The diameters of the two types of wires, 2a and 2b, vary depending on the circumferential length and width of the endless belt 1, but they normally should be between about 0.5 and 1.5mm.

Materials that can be utilized as the coating body are: polyurethane; acrylonitrile butadiene; an ethylene-acryl copolymer; fluorohydrocarbon; epichlorohydrin rubber; polyester; soft polyvinyl chloride; thermoplastic urethane; etc.

The circumferential length of the endless belt 1 of the first embodiment is, for example, 7,620mm, and its thickness is, for example, 3.7mm. In this case, the diameters of the two types of wires, 2a and 2b, should preferably be between about 0.7 and 1.0mm. /4

Moreover, both types of wires, 2a and 2b, are made of metal in the first embodiment, but it is possible to make the spiral wires 2a out of a synthetic resin and the connecting wires 2b out of metal, in which case it is preferred that only the spiral wires 2a be adhered to the coating body 3 and that the adhesion of the connecting wires 2b be prevented.

Figure 3 is a partial cross-sectional drawing illustrating a second embodiment of the invention. This endless belt 11 is obtained by fixing a synthetic resin film 14 onto the inner side of the endless belt 1 of the first embodiment. This makes it possible to obtain even higher inner-diameter accuracy. Also, since the frictional coefficient of the film's surface is small and the surface accuracy is excellent, it is not necessary to polish the inner surface, making the production easier.

As the film 14, it is possible to use a synthetic resin film composed

of polyethylene, polypropylene, polycarbonate, polyvinyl chloride, polyester, polyamide, or the like or a stainless-steel film.

Figure 4 is a partial perspective view showing a third embodiment of the invention, in which the outer surface (i.e. the surface that contacts felt) of the endless belt 1 of the first embodiment is provided with drains 25 along the longitudinal direction of the belt. This leads to an advantage in that water accumulated on the outer surface of the endless belt 1 after being released from wet paper or felt will be discharged from the endless belt 1 with ease. As for the shapes of these grooves, various shapes, such as roulettes, are possible other than those of this embodiment.

Next, with reference to Figure 5, the usage condition of an endless belt of this invention applied to the extended nip press of a papermaking machine will be described.

In Figure 5, reference numeral 31 denotes a press roll of the papermaking machine, 32 denotes traveling felt that carries and transfers wet paper P on it, 33 denotes a guide roll for guiding and supporting the endless belt 1 for pressuring, 34 denotes a tension roll, 35 denotes a pressuring shoe that pressures the endless belt 1 against the press roll 31, and 36 denotes a pressure source for applying a pressure onto the pressuring shoe 35.

As is clear from the drawing, the endless belt 1 travels as it becomes bent along the press roll 31, guide rolls 33, and tension roll 34. Since the spiral wires 2a comprising the core body 2 can swing around the connecting wires 2b and the two types of wires, 2a and 2b, are not mutually adhered, the core body 2 can become displaced with ease inside the coating

body 3 in the areas in which [the endless belt] becomes bent. As a result, the endless belt 1 can become bent easily and smoothly while traveling.

Exactly the same can be said about the second embodiment and third embodiment.

As for the structure of the netted core body 2, it is possible to utilize the combination of ring-like wires 42a and linear wires 42b such as those illustrated in Figure 6 other than the above-described combination of the spiral wires and linear wires. The core body 42 shown in Figure 6 is provided with the structure of a flat net by many ring-like wires 42a being connected via many linear wires 42b arranged in parallel in the longitudinal direction of the belt. When this structure is adopted, at least the ring-like wires 42a should be kept from adhering to the coating body.

Moreover, it is possible to optionally use the structures of commonly-known netted materials, such as a common wire sheet, in which the same type of wires are connected to one another in a manner such that the meshes are diamond-shaped.

[Effects of the Invention]

According to an endless belt of this invention, a netted material is utilized as the core body and at least part of the netted material is not adhered to the coating body as described in the above. Therefore, the endless belt has appropriate flexibility and yet elongates very little. Also, it is easy to provide it with a uniform thickness and an endless shape and to adjust its dimensions. Moreover, the endless belt also has superb durability.

Moreover, if a film is fixed onto the entire surface of the coating body, the inner-diameter accuracy will be increased further, the frictional coefficient of the film's surface will be smaller, the surface accuracy will be excellent, and it becomes unnecessary to polish the inner surface. As a result, the production is simplified.

Furthermore, if drains are provided to one side of the coating body, water accumulated on the belt can be discharged with ease. /5

4. Brief Description of the Drawings

Figure 1 is a vertical partial cross-sectional drawing illustrating the first embodiment of the endless belt of the invention for papermaking, Figure 2 is a magnified partial plane view of the core body of the same belt, Figure 3 is a vertical partial cross-sectional drawing illustrating the second embodiment, Figure 4 is a partial perspective drawing illustrating the third embodiment, Figure 5 is a schematic explanatory drawing illustrating the structure of the extended nip press of a papermaking machine, and Figure 6 is a magnified partial plane view illustrating another embodiment of the core body.

Figure 7 and Figure 8 are partial cross-sectional explanatory drawings of conventional endless belts for papermaking.

(Explanation of the Reference Numerals)

1, 11, 21 = endless belt

2, 12, 22, 42 = core body

2a, 12a, 22a = spiral wire

2b, 12b, 22b = connecting wire

3 = coating body

14 = film

25 = drain

42a = ring-like wire

42b = linear wire

Fig. 1

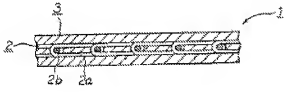


Fig. 3

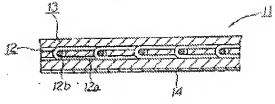


Fig. 2

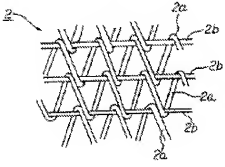
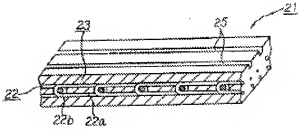


Fig. 4



/612

Fig. 5

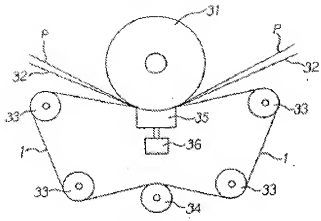


Fig. 7

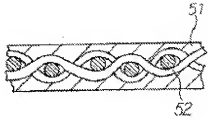


Fig. 6

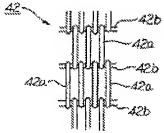


Fig. 8